

US EPA RECORDS CENTER REGION 5



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Geology Department
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Professor:

I have assembled this report on the existing creosote problem in St. Louis Park for your use. The intention of this report is to describe the operations at the refinery and treatment plant, from start to finished product. Also you will find background information on the wood preserving creosote and industry which is pertinent to the St. Louis Park problem. Finally, a brief hydraulic description of the area is included along with a topographic map of the industrial site.

I was not able to obtain a sample of creosote as you requested, but I have named a few sources that may be able to supply such a sample.

Respectfully yours,

James Bailey
Senior, Agricultural Engineering
University of Minnesota

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The Wood Preserving Industry

The purpose of the wood preserving process is to impregnate wood fibers with materials that will preserve them against wood fungi and other related wood deteriorating organisms. Wood preserving includes the treatment of poles, posts, railroad ties, structural posts, construction poles, and lumber used in areas of extreme environmental conditions.

There are a number of preservatives that have been used throughout the years, including solutions that contain creosote, pentachlorophenol, petroleum oil, and many various water soluble metal salts that contain arsenic, copper, chromium, and phenol. The purpose of the treating operation is to impregnate the wood cells. Particular emphasis is given to the sapwood cells, which constitutes the outer most wood layer. Sapwood is more susceptible to rot for most wood species, than is heartwood, or the center of the wood species. The thickness of sapwood may be small or up to several inches. Therefore, there is a need for deeper penetration of the preservatives when treating certain, thick sapwood wood timbers. Also the type of environment the material is expected to be subjected to will determine the depth of penetration needed.

The wood that is normally treated in Minnesota includes the western red cedar, Douglas fir, Norway and jack pines, and some hemlock and oak. The effect of the addition of the wood preservative is to extend the life of the wood from five to fifteen years to as much as forty to fifty years.

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There are many methods of preserving wood, among them: dying of the wood, absence of air, spraying, brushing on of chemicals, dipping and soaking and pressure treatments. The penetration of preservatives into most timbers is slow and irregular if they are merely immersed in a liquid, so the technique of applying a positive external pressure to force fluid into the wood pores was developed. (1,4)

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Creosote: A Brief Description

Coal tar based creosote is by far the most important of the oil type wood preservatives. Creosote may be broadly defined as those fractions of the distillates from coal tar that boil between 200° and 400° C. It is a complicated mixture of a large number of organic compounds, and the relative proportions of those depend on the composition of the original coal tar.

The main constituents of creosote may be classified into:

1. Tar Acids - phenol, cresol, exlenol, etc.
2. Tar Bases - pyridine, quindin, acridine
3. "Neutral" oils, consisting of a mixture of naphthalene, and other neutral hydrocarbons

Advantages of Tar Oil (creosote) Preservatives

1. Their effectiveness against both fungal decay and insect attack is great.
2. The penetration and retention required by various kinds of wood, and to timber of different dimensions are good.
3. Standard specifications exist both for liquids and for the treating procedures and requirements.
4. They are not usually corrosive to metals.
5. They can be easily applied by the method mentioned earlier.

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Disadvantages of Tar Oils (creosote) Preservatives

1. All tar oils are partially volatile and give off pungent and objectionable odors. This limits the use of such preservatives to places where the undesirable odors could be permitted.
2. Creosote oils tend to bleed from impregnated timber especially when the latter is exposed to sunshine, and as a result the surface of the wood may become sticky and may soil materials which come in contact with it.
3. Paint can not be applied to creosoted wood.
4. When preventive measures are not taken, a great risk of soil and water pollution and contamination arises.

Creosote retention values of 8#/cubic feet to 24#/cubic feet can be specified. This gives some idea of how much creosote is actually absorbed by the wood. (1,2,4)

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The Republic Creosote Company Operation

In order to deal with the problem of creosote wastes, it must first be understood how the creosote pollution occurred and the sources of contamination. It appears that four avenues exist for such contamination:

1. Major spillage due to tank failure, accidental overflows, etc.
2. Everyday spills, leaky pipes, drippings from treated wood products, etc.
3. Seepage from waste water disposal ponds and sludge disposal sites.
4. Rainwater runoff through the creosote yard.

It appears that any or all of these processes may have taken place at the St. Louis Park site. The following details what was happening during the creosote process at Republic Creosote Company. (4,6)

Wood Treatment Process

The treating plant received creosote oil from the refinery and mixed it with petroleum oil (#1AWPA). This mixture was stored and used at a temperature of about 210° F. The treating was done in three cylinders which were six feet in diameter and 170 feet long. Bundled railroad ties were placed on rails and wheeled into the cylinders, which are then sealed. The oil mixture is pumped into the cylinders and a pressure of 200 psig was applied and maintained for

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48 hours. The oil was then drained off from the cylinders and returned to storage. A vacuum of 20 in. Hg. was maintained for one hour to remove excess oil.

The only waste water from this operation was steam condensate and boiler blow down, which were discharged into a settling basin. The overflow from the basin passes through the same line to the ditch, as the waste water from the refinery. (6 A-D)

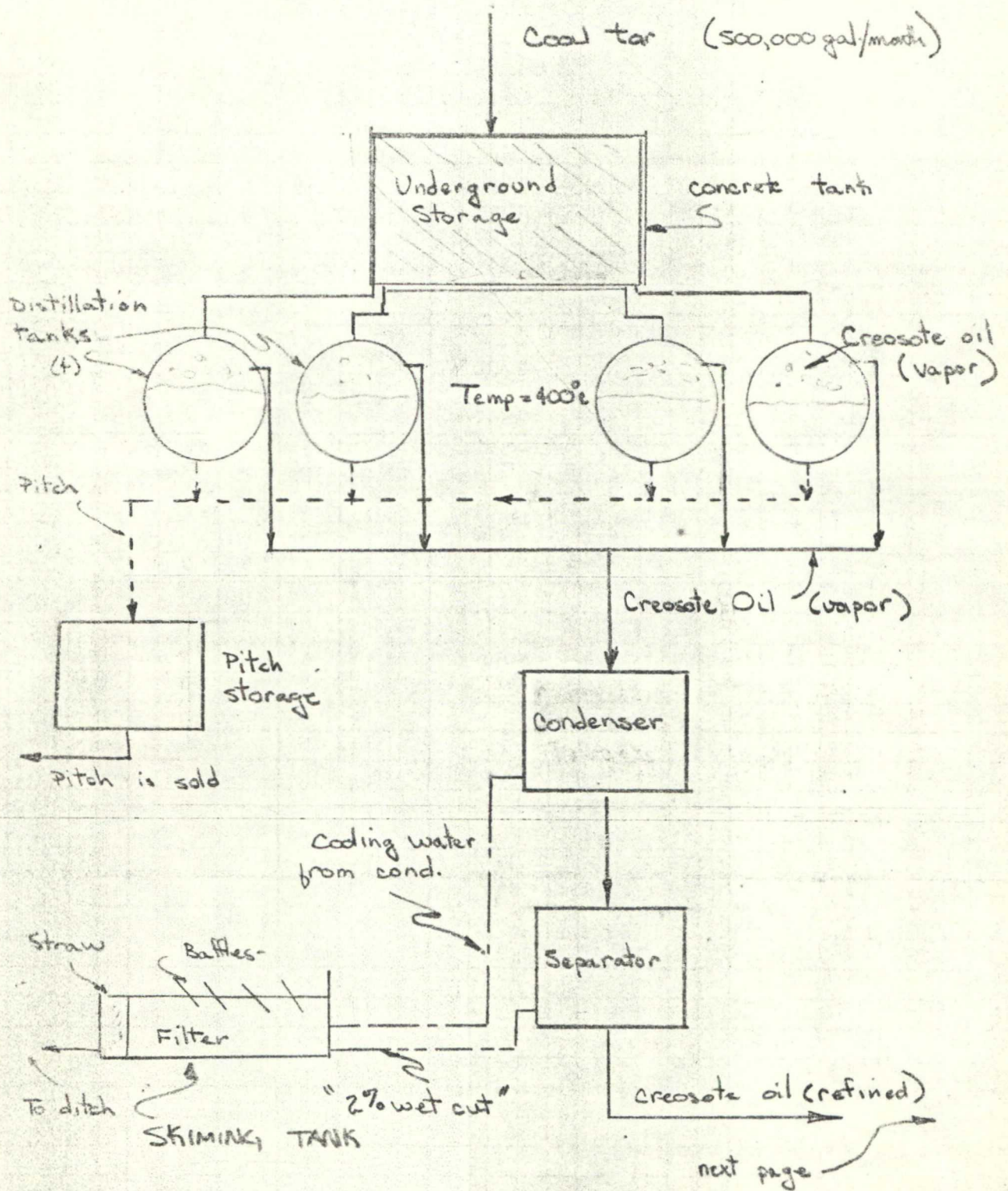
Distillation Process

The refinery received approximately 500,000 gal./month of coal tar, from which the lighter fractions (napthalene, xylene, toluene, benzene) had already been removed. The coal tar was stored in an underground concrete pit and was fed into one of four stills. The stills operated at 400° C. and the creosote oil was removed from the heavier pitch as a vapor. The pitch was pumped to storage tanks and then sold to roofing and road construction companies. The creosote oil was condensed and pumped into a separator to remove the "2% wet cut", which was the water contained in the raw coal tar. The "2% wet cut", which at a process of 500,000 gal./month amounts to approximately 10,000 gal./month, was discharged through a pipe line into a skimming tank along with the condensor cooling water (40 gpm). The underflow passed through two straw filters before discharging into the ditch which passed under Highway 7. (6 A-D)

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REPUBLIC CREOSOTE CO.

REFINERY OPERATIONS - SCHEMATIC DIAGRAM

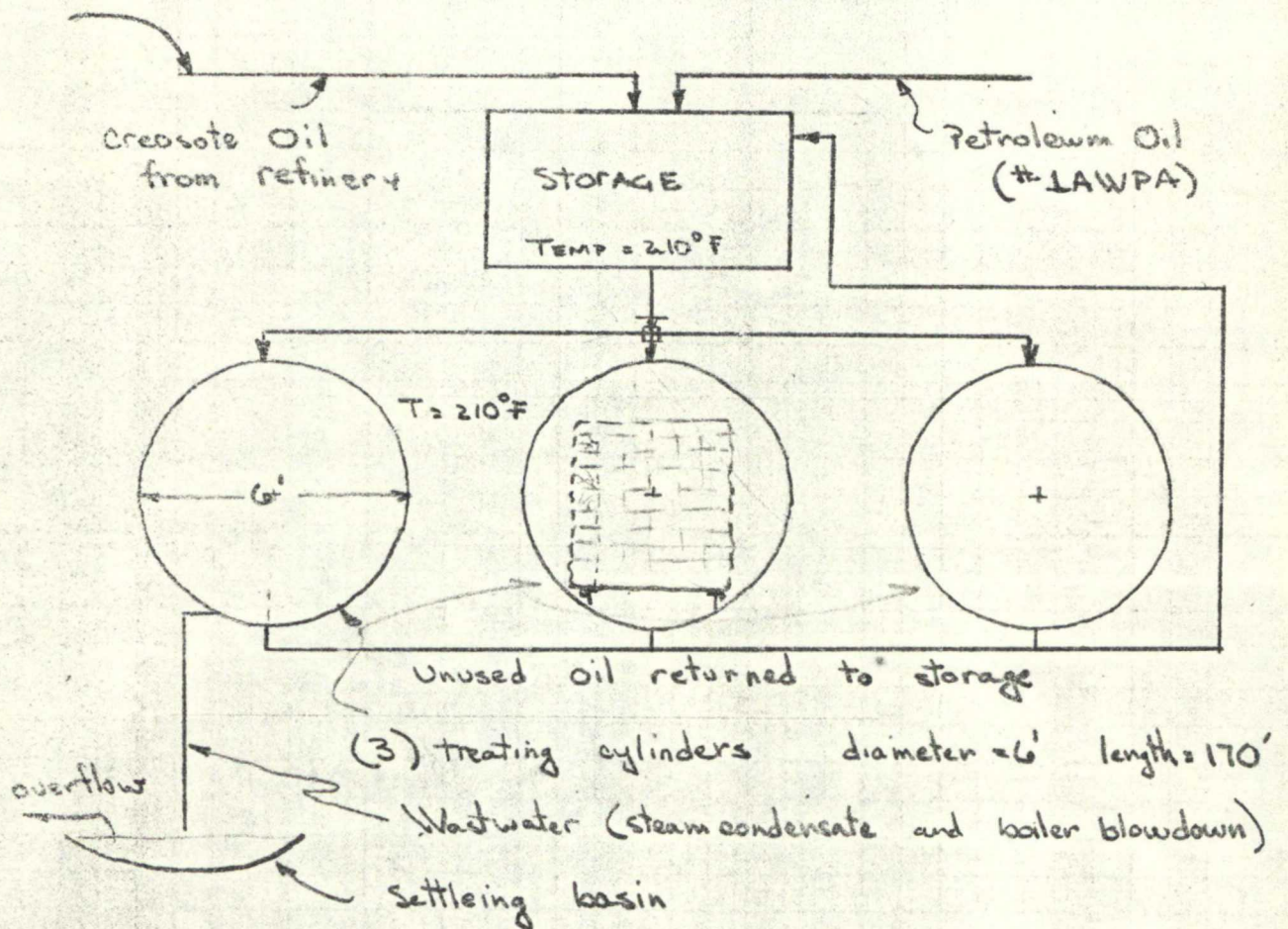


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FIGURE 1

REPUBLIC CREOSOTE CO.

TREATING OPERATIONS - SCHEMATIC DIAGRAM



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FIGURE 2

Physical Condition of Refinery and Treatment Plant

The potential and extent of pollution in the ground will relate to the physical condition of the plant and the general housekeeping of the facility as well as the length of operation. Past records indicate that the Republic Creosote site was saturated with oil around and near the refinery buildings, holding tanks, and pressure autoclaves.

The skimming tank mentioned earlier, also presented another pollution source. The oil separator tank was a rectangular basin that received the effluent from the refinery and waste water from the pressure autoclaves. This skimming tank separated out the oil with wooden baffles that acted to hold back the oil. At the discharge end of the separator was a straw basket that removed the remaining oil. The oil-water mixture was pumped with a float operated pump from a sump, through the separator. Records indicate that the separator had flooded out occasionally and that oil was still prevalent in the discharge from the separator.

In summary, the Republic Creosote Plant did not store petroleum products on their property in a safe non-polluting manner. The effluents from the refinery and treatment processes were not adequately filtered before discharge to surface waters, nor were they diverted to municipal sanitary sewers. Runoff water was also allowed to cross the plant property, possibly picking up creosote residues, instead of being diverted from company property. (4,6 A-D)

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Hydrologic Characteristics of Republic Creosote Site

Rainwater runoff can complicate the problem of industrial pollution. The St. Louis Park creosote site is located in a low area into which the surrounding land drains. The plant area itself comprises about 78 acres. The total drainage area is probably larger than this however.

The company stored treated railroad ties out in their yard. This presented a washoff problem during rainstorms. The company claims there was no drippage from the treated wood after removal from the pressure cylinders.

Surface water flowed across the company property from north to south and left the property via a culvert under Walker Street at the south end of the property. At this point the effluent of the oil separator combined with any surface runoff which may have been present.

The water then flowed from the culvert to an adjoining marsh and two small ponds which are separated from the plant site by State Highway 7 and bounded by Walker, West Lake and Oregon Streets.

The southern portion of the property was frequently under water during and after heavy rains. (3,5)

The general runoff direction in the site area is roughly sketched in Figure 3. Figure 4 provides a map of the area directly south of the creosote plant. For more accurate information a topographic map of

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SKETCH MAP OF AREA DIRECTLY
REPUBLIC CREOSOTE PLANT SOUTHWEST OF
REPUBLIC CREOSOTE PROPERTY

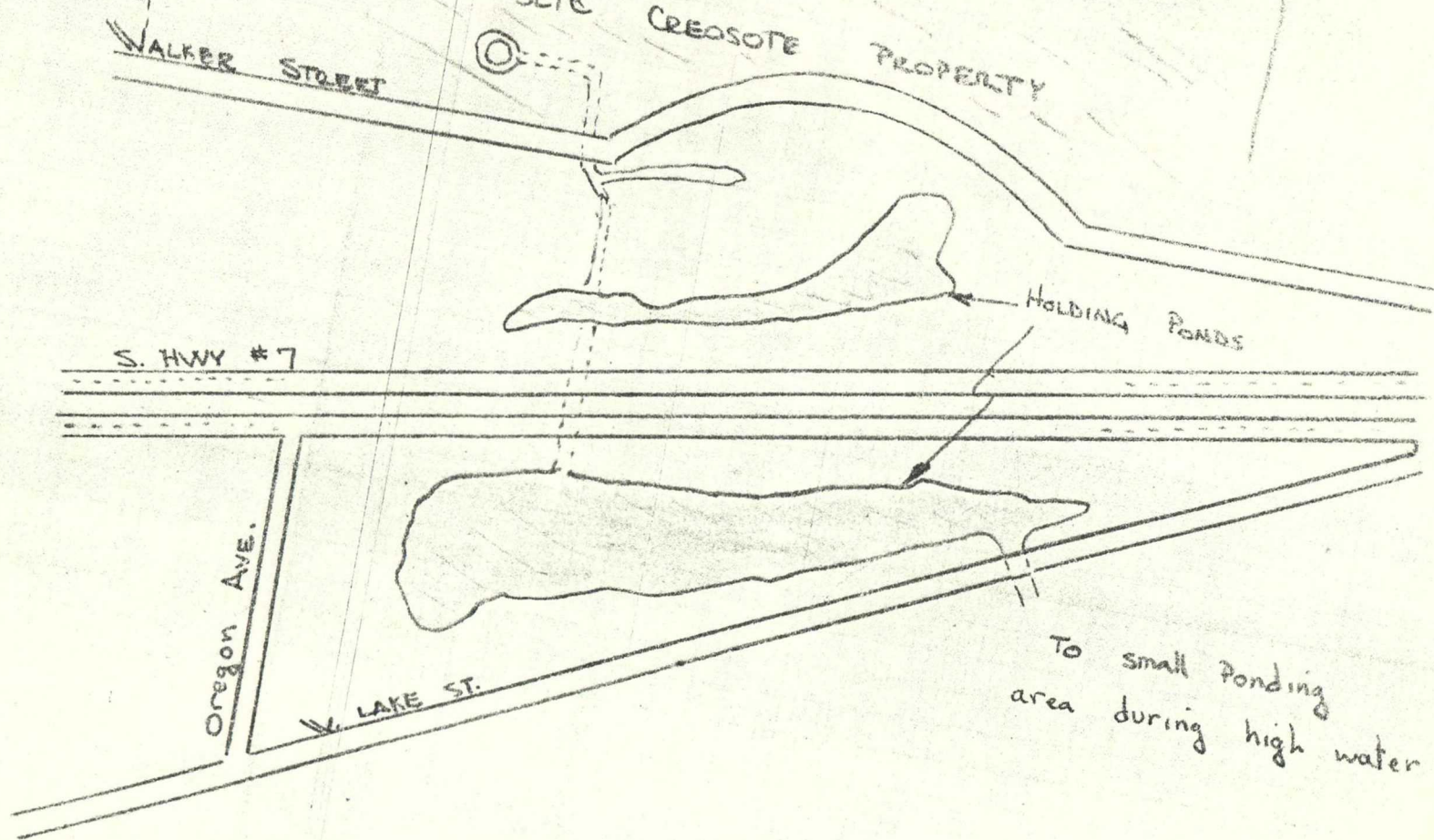


FIGURE 4

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the property concerned can be found at the back of this report. The topographic map displays the location of the plant facilities relative to the property boundaries. Currently, I am in the process of obtaining topographic maps for the ponding areas, south of Republic property.

Conclusion

This report has dealt with the Republic Creosote Plant in St. Louis Park, Minnesota. A discussion of the wood preserving industry and a description of creosote were included to form a general view of the Wood Treatment Industry and products. Most importantly the Republic Creosote Co. operations were defined and explained. The process for extraction of creosote oil from coal tar and the subsequent application of that oil onto wood; the actual and possible sources of pollution were identified. Finally, the hydraulic characteristics were examined.

In summary, this report contains the operating history of the plant. No attempt was made to look at the legal battle now going on between Republic and the MPCA, or to analyze the findings of tests conducted on or near the site, or to suggest possible solutions to the pollution problem that exists at this west suburban industrial site.

One item that I did not obtain, which may be useful in future work, is a sample of creosote. Laboratory analysis of such a sample would help in understanding the physical and chemical characteristics of creosote. The main problem in obtaining a sample is availability.

Since the closing of the St. Louis Park plant in 1972, there has been

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creosote available in the Greater Metropolitan Area. This leaves Land O'Lakes Wood Preserving Company at Tenstrike, Minnesota and a company in Siren, Wisconsin as the only two known communities with creosote operations in the region. However, Burlington Northern, Inc. and Wheeler Div. of St. Regis Paper Co. also are known to handle creosote in this area. I suggest that these sources be considered if a sample is desired.

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The following people also helped to make this report possible:

1. Ed Ross - Minnesota Department of Health
2. George Koonce - MDH
3. Dale Wikre - Minnesota Pollution Control Agency
4. Harvey McPhee - City of St. Louis Park

The following people who were not contacted may be able to supply more information:

1. Harvey L. Finch - Operation Manager (Rielly)
Rielly Coal Tar & Republic Creosote Plant
2. Chris E. Cherches - City of St. Louis Park

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